TWG Assessment and Reccommendations for Improved Monitoring

This document addresses the AC request to:

"*Evaluate options for improving and increasing monitoring and reporting of surface water flow and diversions. This would include exploring options for improving existing monitoring sites, developing additional monitoring locations, and exploring technological advances in data collection and reporting, such as SCADA. This will allow for the development of additional opportunity for more "real time" adjustments to assist water users in making quicker management decisions.*"

The extension did not specifically request a summary of current monitoring; however, it is necessary for us to know the existing monitoring to evaluate additional needs.

All recommendations are summarized in Table 1 at the end of the document.

Data Collection and Distribution

1. SCADA Possibilities. **There are no recommended SCADA improvements.**
    a. TWG members did not have suggestions for additional SCADA improvements.
    b. BWCC did not have any specific requests for SCADA improvements.
2. Telemeter Data. This proposal applies to surface water flow, diversions, returns, exchange wells, groundwater discharge, and groundwater levels. Each of these recommendations are discussed in the following sections. **This is recommended as a high priority.**
    a. Ethos and PivoTrac are both currently in use.
    b. The watermaster indicated that the LoRaWAN network for Ethos has been established in the South Valley.
        i. Individual monitoring locations should have the ability to connect with this system and upload data in real-time.
        ii. The infrastructure is in place, but the process needs investment.
    c. There are questions about the accuracy of PivoTrac gage data.
        i. Ragsdale had issues.
        ii. Issues may be due to macrophyte growth.
3. Create an online Data Hub of Hydrologic Data. **This is recommended as a medium priority.**
    a. Online data are available without a data hub.
    b. Ideally, the data hub would provide spatial and temporal water data online.

c. There needs to be a method to regularly maintain the data hub and perform QA/QC on the data.
    i. Building the site is not difficult.
    ii. Maintenance and QA/QC require more effort.
    iii. Maintaining the data hub requires sustained funding.
d. The data hub should be structured to allow for the input and access of multiple data types, including:
    i. Water levels
    ii. Streamflow
    iii. Water Temperature
    iv. Surface water diversions and returns
    v. Groundwater pumping
    vi. Water supply (e.g., SWSI, PNWRF)
    vii. Accounting Model information
    viii. Historical, recent, and real-time data.
e. The data hub should be structured to allow for the addition of different data types in the future
f. The owners of the data (WD37, Ethos, PivoTrac, etc.) would maintain the data sets.
    i. The data need to be available online via an Application Programming Interface (API) for the data hub to scrape the data.
g. The data hub should include the ability to restrict certain data.
    i. Potential data to restrict are those that are necessary for management, administration, and research.
h. The interface (dashboard) should be configured for the non-technical end users' needs.
    i. The dashboard should provide easily understandable descriptions and caveats to prevent confusion and misuse.
    ii. The dashboard should be structured so users can apply different layers or filters.
i. IWRRI is currently working with Research Computing at the University of Idaho (U of I) to create a data hub for integrating various water data sets.
    i. This model can automatically ingest currently available data from any website with an API and serve them on a web interface.
    ii. Funding ends August 2025, and additional funding is required for further development and database management.
    iii. IWRRI has spoken with Ethos about scraping their telemetered data and serving it on the dashboard.

01. Ethos would need permission from the local data holder (e.g., WD 37).

j. There would be additional work associated with incorporating data sets (like temperature) that aren't currently available online.
k. Research Computing at U of I has the requisite skill sets and works quickly.
    i. The BWRGWMA would be a good test case for their project.

Surface Water Monitoring

Surface water monitoring locations are shown in Figures 1 – 3.

<u>Discussion of Current Surface Water Monitoring</u>

1. There are 13 active surface water gages on the Upper Big Wood River and its tributaries (Figure 1).
    a. Big Wood River nr Ketchum – Active USGS Gage 13135500
    b. NF Big Wood River nr Sawtooth NRA HG nr Ketchum – Active USGS Gage 13135520
    c. Warm Springs Creek – Inactive USGS Gage 13137000
        i. This gage is no longer in operation due to a floodplain project that diverts water around the gage.
        ii. The USGS has not been able to find a suitable replacement location.
        iii. Warm Springs Creek nr Gates Rd – Active USGS Gage 13136550 is located upstream and has been operational since 2019 . However, reach gains and diversions that occur between this gage and the Big Wood River are not measurable.
    d. Trail Creek at Ketchum – Active USGS Gage 13137300
    e. Trail Creek nr Sun Valley – Active USGS Gage 13137500
    f. East Fork Big Wood River at Gimlet – Active USGS Gage 13138000
    g. Big Wood River at Hailey Total Flow – Active USGS Gage 13139510
    h. Big Wood R at S Broadford Bridge nr Bellevue – Active USGS Gage 13140335
    i. Big Wood River at Stanton Crossing – Active USGS Gage 13140800
    j. Willow Creek nr Spring Cr Ranch nr Bellevue – Active Gage operated by HDR
    k. Big Wood River nr Bellevue – Inactive USGS Gage 13141000.
        i. Used for historical data.
    l. Rock Creek – Temporary Active IDWR Gage operating during the USGS Camas/Magic characterization study
    m. Big Wood River bl Magic Dam nr Richfield – Active USGS Gage 13142500
2. There are 15 stream gages on Silver Creek and its tributaries, and the Little Wood River (Figure 1).

    a. Upper Patton, Upper Cain, Upper Chaney, Upper Mud, Upper Wilson, and Upper Grove creeks.
        i. These creeks have flow meters which have been maintained and calibrated by Ecosystemsciences, as funding is available.
    b. Lower Mud, Lower Chaney, Lower Stalker, Lower Grove, and Lower Loving creeks, Silver Creek at S Turns, and Silver Creek nr Hwy 20.
        i. These creeks are measured monthly or bi-monthly during the irrigation season by Ecosystemsciences, as funding is available.
    c. Silver Creek at Sportsman Access nr Picabo (Sportsman) – Active USGS Gage 13150430
    d. Ragsdale Gage – Active gage operated by HDR
3. There are 3 stream gages on the Little Wood River (Figures 1 and 2).
    a. Little Wood River nr Carey– Active USGS Gage 13148500
    b. Little Wood River nr Richfield (Station 10) – Active gage operated by IDWR
    c. Little Wood River nr Shoshone (Station 54) – Active gage operated by IDWR
4. There is one gage in Magic Reservoir
    a. Magic Reservoir nr Richfield – Inactive USGS Gage 13142000.
    b. Stage reported annually at the end of irrigation season to USGS by BWCC.
5. There is one permanent gage on Camas Creek, and one gage on its tributaries (Figure 3).
    a. Camas Creek nr Blaine – Active USGS Gage 13141500
    b. Camp Creek – temporary IDWR gage
6. There are several streamflow measurement locations on the Camas Prairie used to characterize groundwater/surface water interaction and measure additional flow from tributaries and groundwater inflow (Figure3).
    a. Some of the mapped sites are being measured for the USGS Camas/ Magic Reservoir study for the creation of synthetic hydrographs
        i. Camp Creek at Hwy 20 (temporary gage)
        ii. Rock Creek (temporary gage)
        iii. Poison Creek,
        iv. Lava Creek.
    b. There were three tributary gages on Willow Creek, Camp Creek, and Corral Creek a few years back operated by PivoTrac and funded through IWRB money granted to the Camas Prairie Groundwater Users Association. They operated for approximately two years.
        i. TWG members did not know if they are still operational.
        ii. The stage-discharge curves were poorly defined, especially at low flows.

Discussion of Proposed Surface Water Monitoring Improvements

1. A dependable gage downstream of the bifurcation on the Milner-Gooding canal near Shoshone is needed. **This is recommended as a high priority.**
    a. The current gage does not work correctly at all flow rates.
    b. This gage is important for the Accounting Model and WD37 administration.

2. Fund gage maintenance and telemetry of the 15 stream gages and manual measurements on Silver Creek and its tributaries. **This is recommended as a low priority.**
    a. Telemeter continuous, real-time data from Upper Patton, Upper Cain, Upper Chaney, Upper Mud, Upper Wilson, and Upper Grove creeks.
        i. These creeks are equipped with flow meters.
        ii. Consistent funding is needed to maintain, calibrate, and telemeter the gages.
        iii. These gages may be important for the Groundwater Management Plan administration.
    b. Fund monthly measurements on Lower Mud, Lower Chaney, Lower Stalker, Lower Grove, and Lower Loving creeks, Silver Creek at S Turns, and Silver Creek nr Hwy 20.
        i. These gages may be important for the Groundwater Management Plan administration.
    c. The benefit from these measurements may not justify the cost.
3. Increase the frequency of site visits to the Sportsman gage. **The TWG recommends maintaining two-week visits that commence June 1st as a high priority.**
    a. Macrophyte growth can cause issues without regular maintenance.
    b. The USGS is currently visiting the site every two weeks from July through August.
    c. USGS and IDWR hydrologists think two-week site visits are probably adequate, but suggest increased visits beginning in early June.
4. A temporary gage at on the Little Wood River at the confluence with Silver Creek. **This proposal is a medium priority.**
    a. This gage is necessary to quantify inflow from Little Wood Reservoir.
    b. There may not be flow in many years.
    c. The TWG Recommends installing a transducer and rated section to determine the level of need.
5. A gage at Suzie Q has been discussed. **This proposal is not a current need.**
    a. There is debate regarding the benefit of a gage at Suzie Q.

b. Real-time reporting of all the Silver Creek diversions and exchange wells downstream of Sportsman would be necessary to calculate seepage during the irrigation season.
c. Adding more diversions/returns adds uncertainty.
d. Sportsman is used for the WRV, and IDWR modelers do not recommend abandoning Sportsman.
e. Sportsman was chosen based on a USGS report from the 1970's which determined the gains/losses downstream of Sportsman were less than measurement uncertainty. Ground water-surface water relations in the Silver Creek area, Blaine County, Idaho
f. IDWR measurements indicate minimal gains/losses from Sportsman to Highway 20. (Draft) Design Document: Reach Gain Calibration Targets for the Big Wood River and Silver Creek | March 31, 2015 | idwr.idaho.gov.
g. Improved monitoring of the diversions and exchanges upstream of Sportsman may be a better use of resources.

6. Two Silver Creek Wetlands area gages are proposed to quantify losses in the wetlands. **This proposal is a low priority.**
    a. Existing data are not adequate for calculating losses.
    b. If the water users don't have a means to physically reduce seepage losses between the gages, the benefit from gages do not justify the cost.
7. Perform USGS bathymetry on Magic Reservoir. **This proposal is a high priority.**
    a. The USGS will not report reservoir contents because bathymetry has not been performed since the reservoir was constructed.
    b. Surveying Magic Reservoir to develop an accureate volume-to-stage (V-Q) relationship would eliminate the need for gaging smaller tributaries entering Magic in the Accounting Model.
    c. The V-Q relationship combined with the outflow gage on the Big Wood would incorporate combined inflows from tributaries and groundwater (reach gain).
    d. The Magic Reservoir reach gain is critical for the WD37 accounting model.
    e. The IDWR accounting modelers strongly recommend that the USGS perform the bathymetry.
        i. The USGS provides real-time data, high quality data.
8. There are no recommendations for improved surface water monitoring in the Camas Prairie.

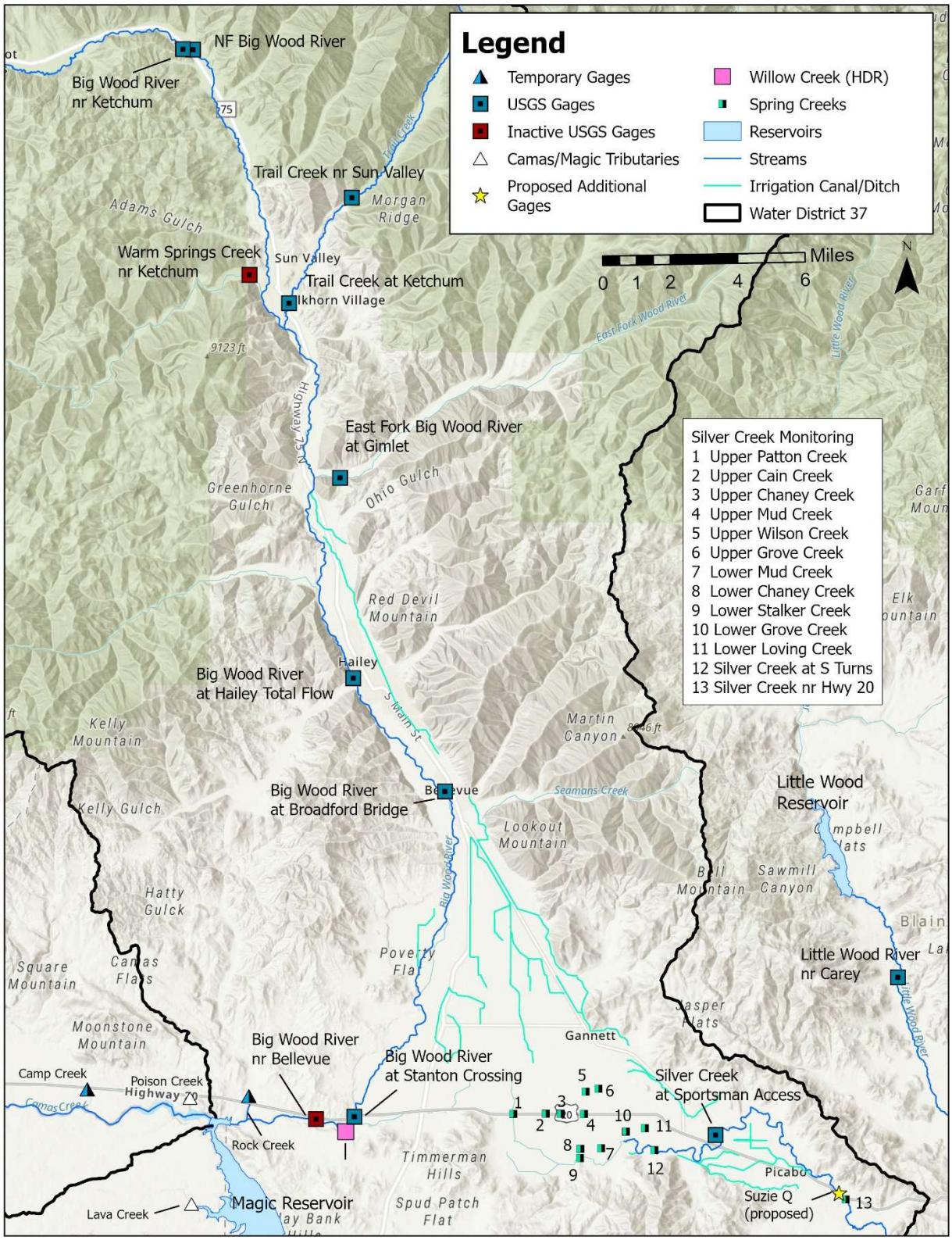

Figure 1. Surface water monitoring in the upper basin.

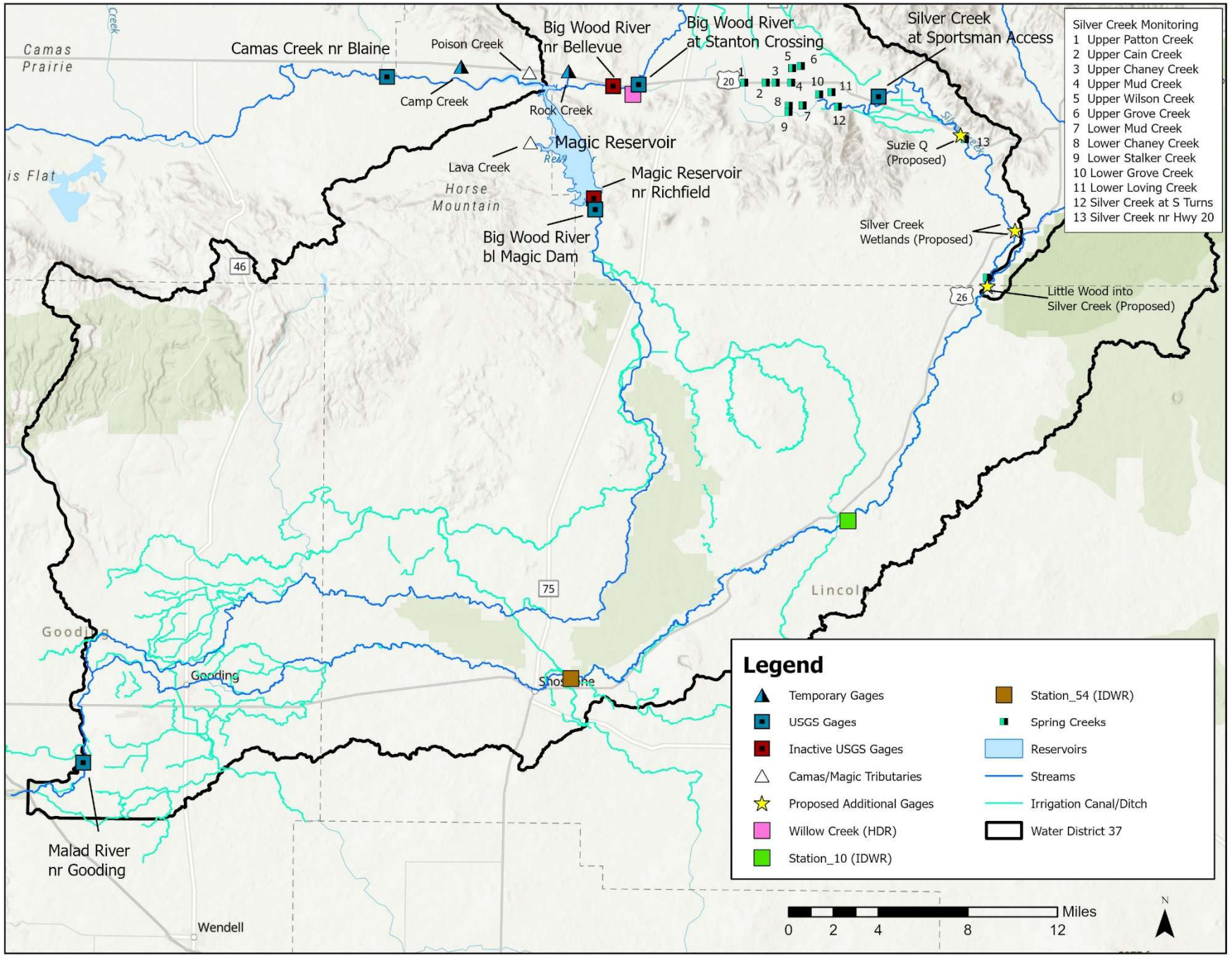

Figure 2. Surface water monitoring in the lower basin.

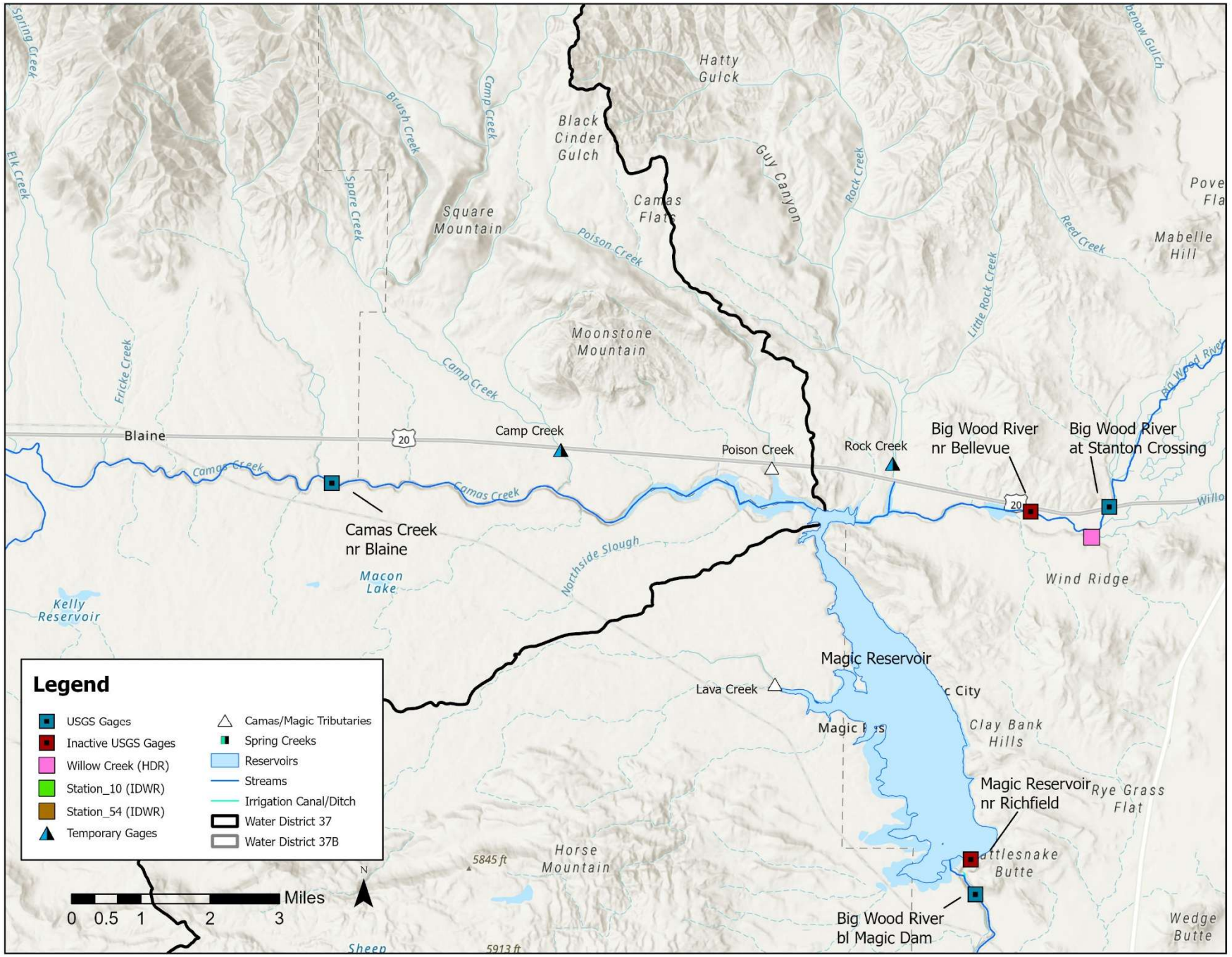

Figure 3. Surface water monitoring on the Camas Prairie.

Surface Water Management Monitoring

Monitoring locations for diversions, returns, exchange wells, and injections are shown in Figures 3 and 4.

Discussion of Current Surface Water Management Monitoring

1. The District 45 canal diversion appears to have both PivoTrac and Ethos.
    a. There are data on PivoTrac.
    b. The watermaster has a dashboard of real-time data from Ethos.
2. The WD37 watermaster provided a shapefile of Survey123 locations that the ditch riders use. The locations (small green dots) are hard to see in Figures 4 and 5 but show up clearly if you zoom into the figures.
    a. Not all diversion records from the watermaster diversion records are in the Survey123 shapefile.
3. The monitoring locations above and below the bifurcation on the Milner-Gooding canal are not well known.
    a. Station 53 is located approximately 1 mile upstream of the bifurcation on the Milner-Gooding Canal, and Station 56 is immediately downstream of the bifurcation on the Milner-Gooding Canal..
4. In general, TWG members have not been able to relate station numbers to gage names used in other data sets.
5. Camas diversion data are in the WD 37B Diversion Database back to 2016.
    a. There are 78 meters, two Power Consumption Curves, two time clocks , and 48 surface water measuring devices measured weekly.
        i. No mention of telemetry.

Discussion of Proposed Surface Water Management Monitoring Improvements

1. Telemeter continuous, real-time data of diversions from, and exchange well inflows to, Silver Creek and its tributaries. **This proposal is a high priority.**
    a. Greatly improve the calculation of groundwater discharge into Silver Creek.
    b. Very beneficial for correcting Sportsman Access flow to natural flow.
    c. Picabo Livestock submitted a CIEF application that proposes installing Ethos at four diversions on Picabo Livestock lands.
        i. The Main canal diversion on Siler Creek
        ii. The Alverson diversion on Siler Creek
        iii. The Iden diversion on Siler Creek
        iv. The Gillian diversion on Loving Creek

v. The application was not approved due to issues regarding how the data would be integrated.

2. Determine and map the locations of important diversions, returns, and stream flow sites. **This proposal is a low priority.**
    a. Improve the understanding of how the system is monitored, administered. and managed.
3. There are no recommendations for improved surface water management monitoring in the Camas Prairie.

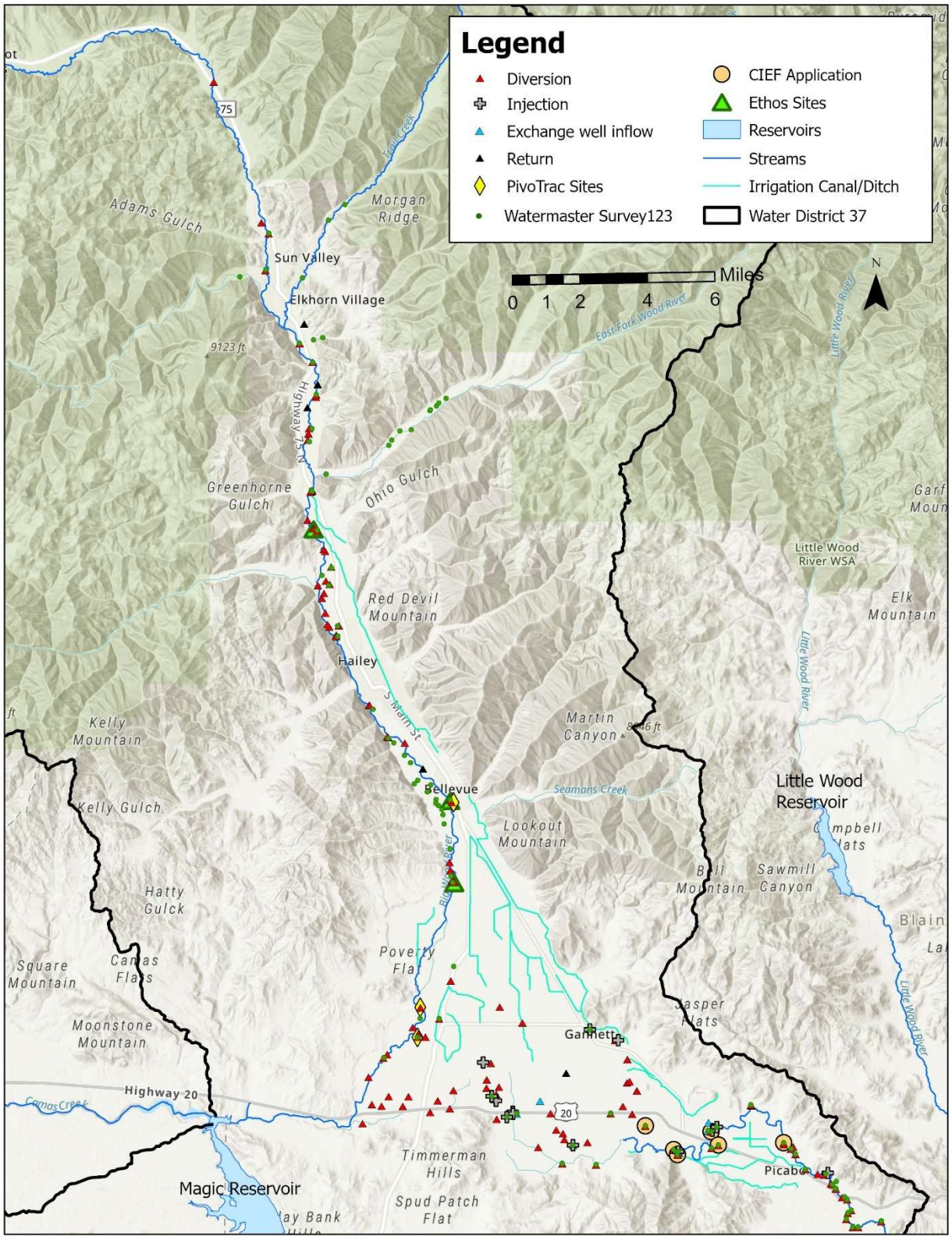

Figure 4. Water management monitoring in the upper basin.

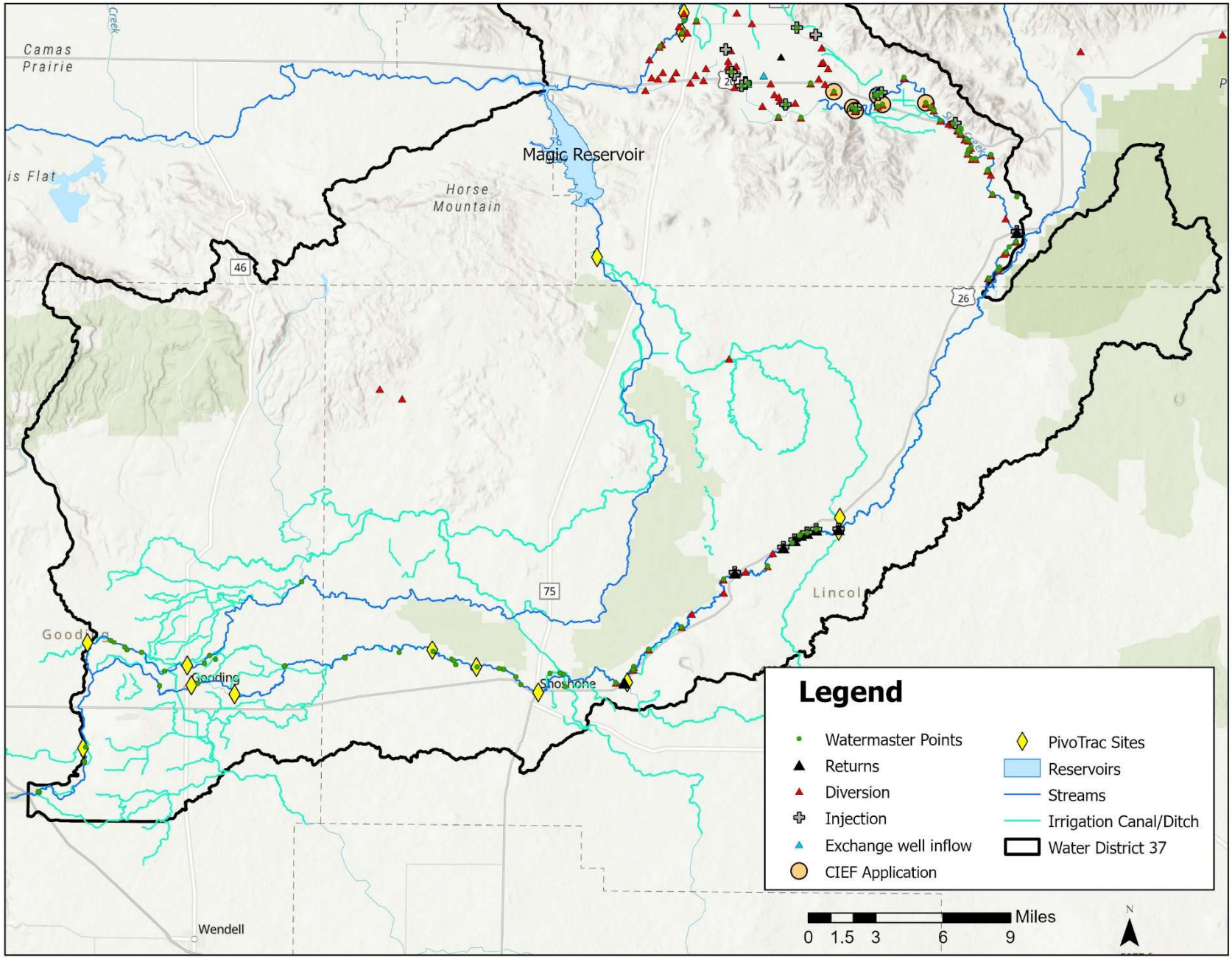

Figure 5. Water management monitoring in the lower basin.

Groundwater Discharge Monitoring

Water Management Information System (WMIS) locations for groundwater diversions are shown in Figures 6 – 8.

Current Groundwater Discharge Monitoring

1. Currently, data is collected by visiting all pumps.
    a. This approach is very time-consuming.
    b. This approach can only characterize mid-season usage for a limited set of pumps.
2. Currently, groundwater pumping isn't characterized in WMIS until after the irrigation season.
    a. The watermaster has to visit each well, calculate pumping, then publish the data.

Discussion of Recommended Groundwater Discharge Monitoring Improvements

1. Telemeter real-time groundwater discharge. **This proposal is a high priority.**
    a. Greatly reduce the watermaster's time and effort.
    b. Improve the watermaster's the ability to make management descidions in real-time
    c. Telemetry of rea-time exchange-well pumping into the creeks and pumping by groundwater rights administered in priority with surface water would improve the accuracy and usablity of the Accounting Model.
    d. Some water users may not be comfortable with the ability for the gneral public to view real-time data.
        i. Open communication with the water users to help them understand the benefits of real-time data and alleviate their concerns.
        ii. One possibity would be to provide real-time data to the Water District and IDWR, then make the data publicly available after the irrigation season.
        iii. The process could start with installation on a subset of selected pumps to better characterize in-season usage. Real-time monitoring could be expanded to create comprehensive coverage.
    e. The watermaster has indicated that the LoRaWAN network for Ethos has been established in the South Valley. Therefore, individual monitoring locations should have the ability to connect with this system and upload data in real-time.
        i. The infrastructure is in place, but the process needs investment.

2. There are no recommendations for improved groundwater management monitoring in the Camas Prairie.

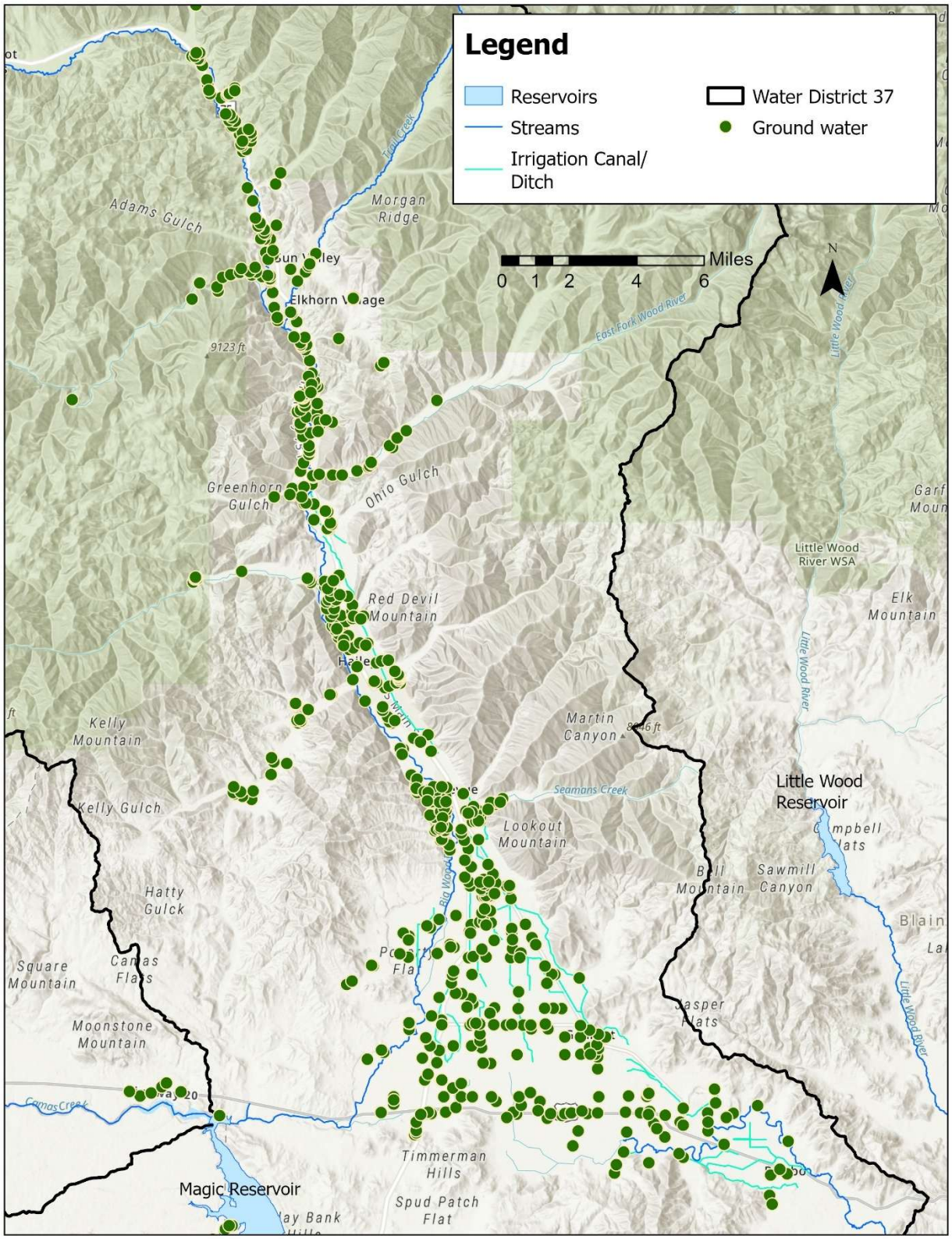

Figure 6. WIMIS groundwater locations in the upper basin.

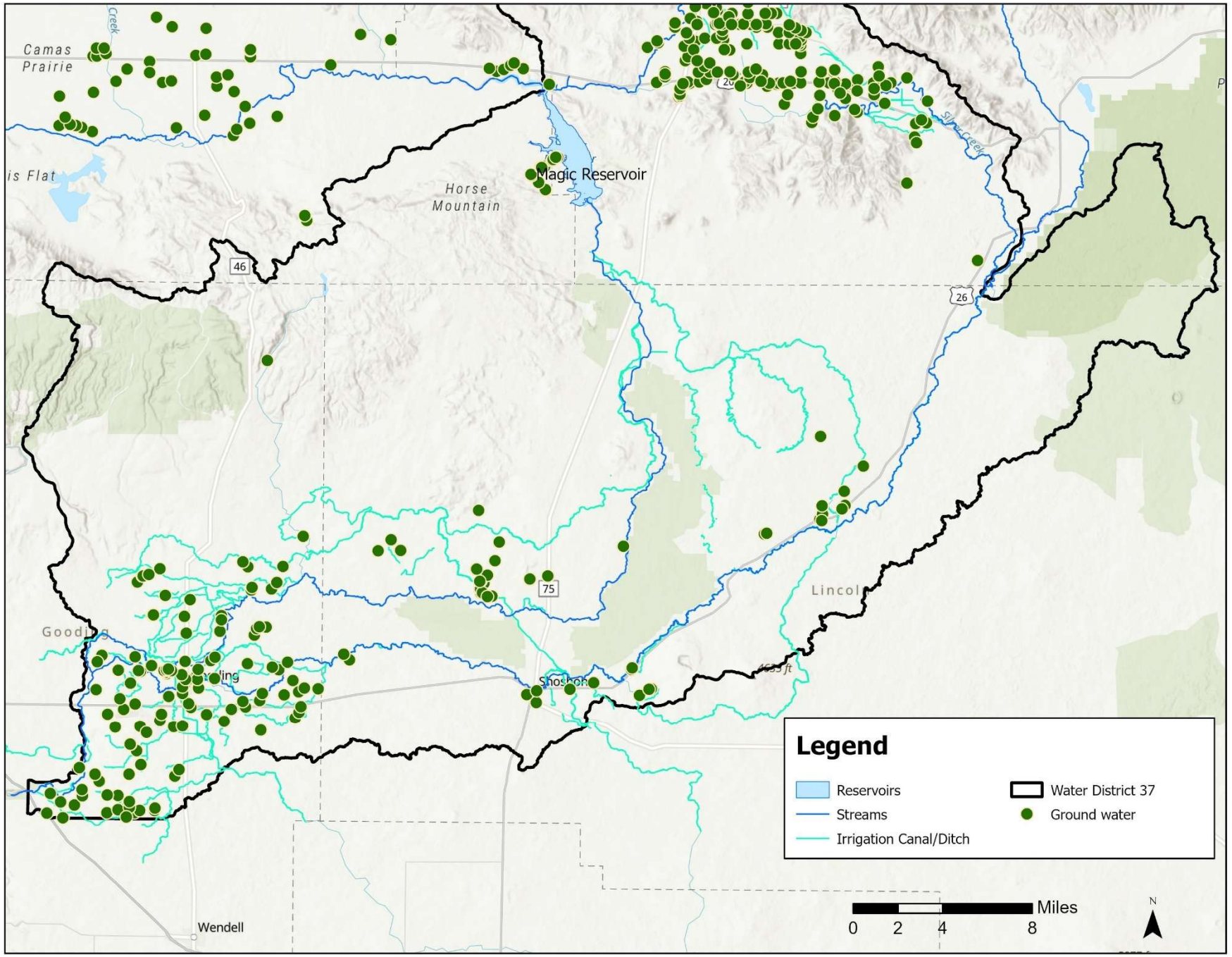

Figure 7. WIMIS groundwater locations in the lower basin.

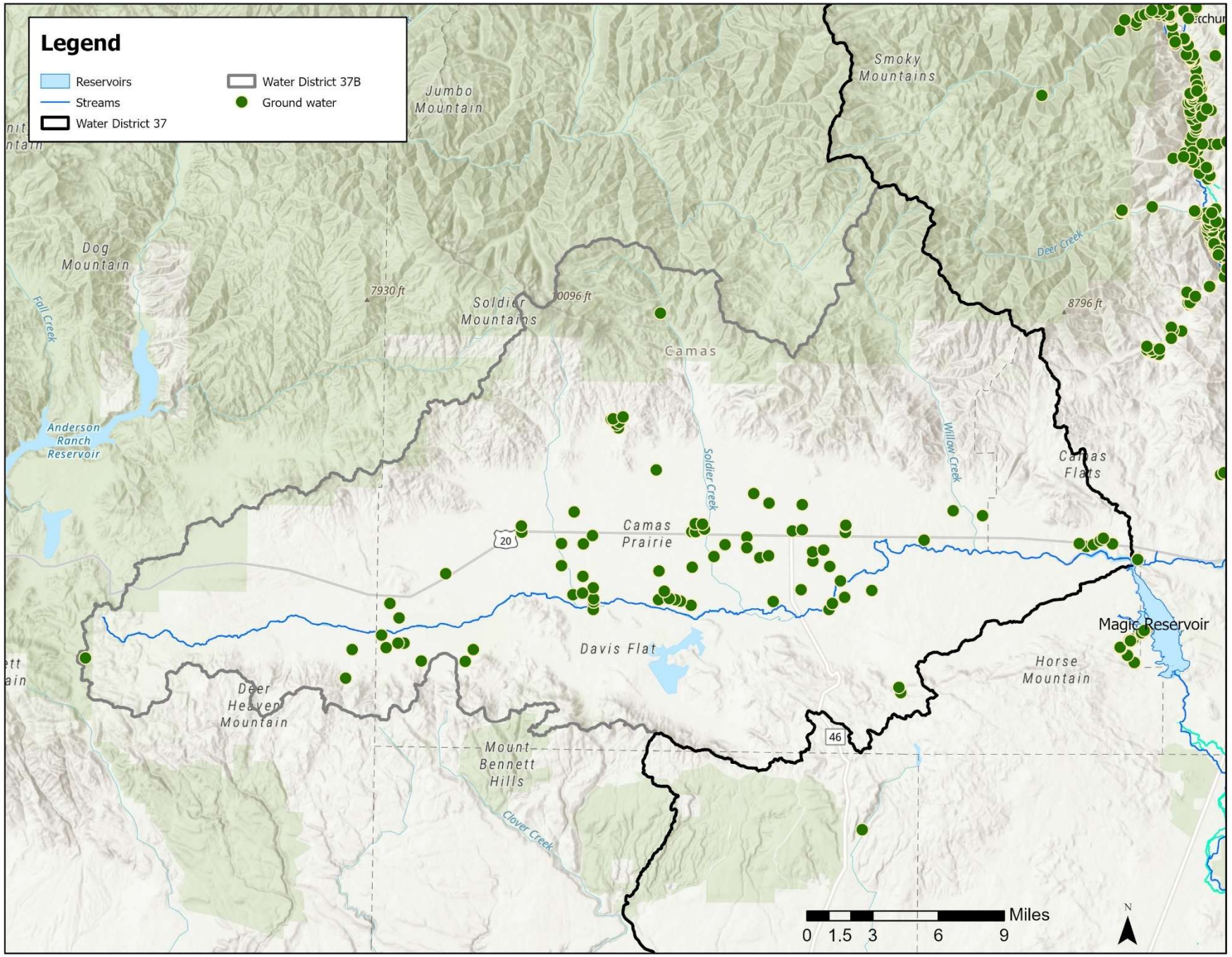

Figure 8. WMIS groundwater locations on the Camas Prairie.

Groundwater Level Monitoring

Water level monitoing wells are shown in Figures 9 – 11.

Current Monitoring

1. There is good spatial coverage in WD37 and WD37B.
2. IDWR has a robust water level monitoring network, and the data are available on the website as they are updated.
3. SVGWD has 10-12 wells with transducers.
    a. Some data are shared with IDWR.

Recommended Groundwater Monitoring Improvements

1. There is a need for a cold-water monitoring well in the Warm Springs Creek area. **This proposal is a medium priority.**
    a. The well that was previously measured is no longer accessible.
    b. Important for WRV model calibration
    c. Ketchum has some municipal wells that might work.
        i. They may not want outside personnel accessing these wells,
        ii. Ask if they are monitoring these wells and would share the data.
2. Telemetered real-time, water level data. **This proposal is a medium priority.**
    a. Allow all water users to observe aquifer conditions in real-time.

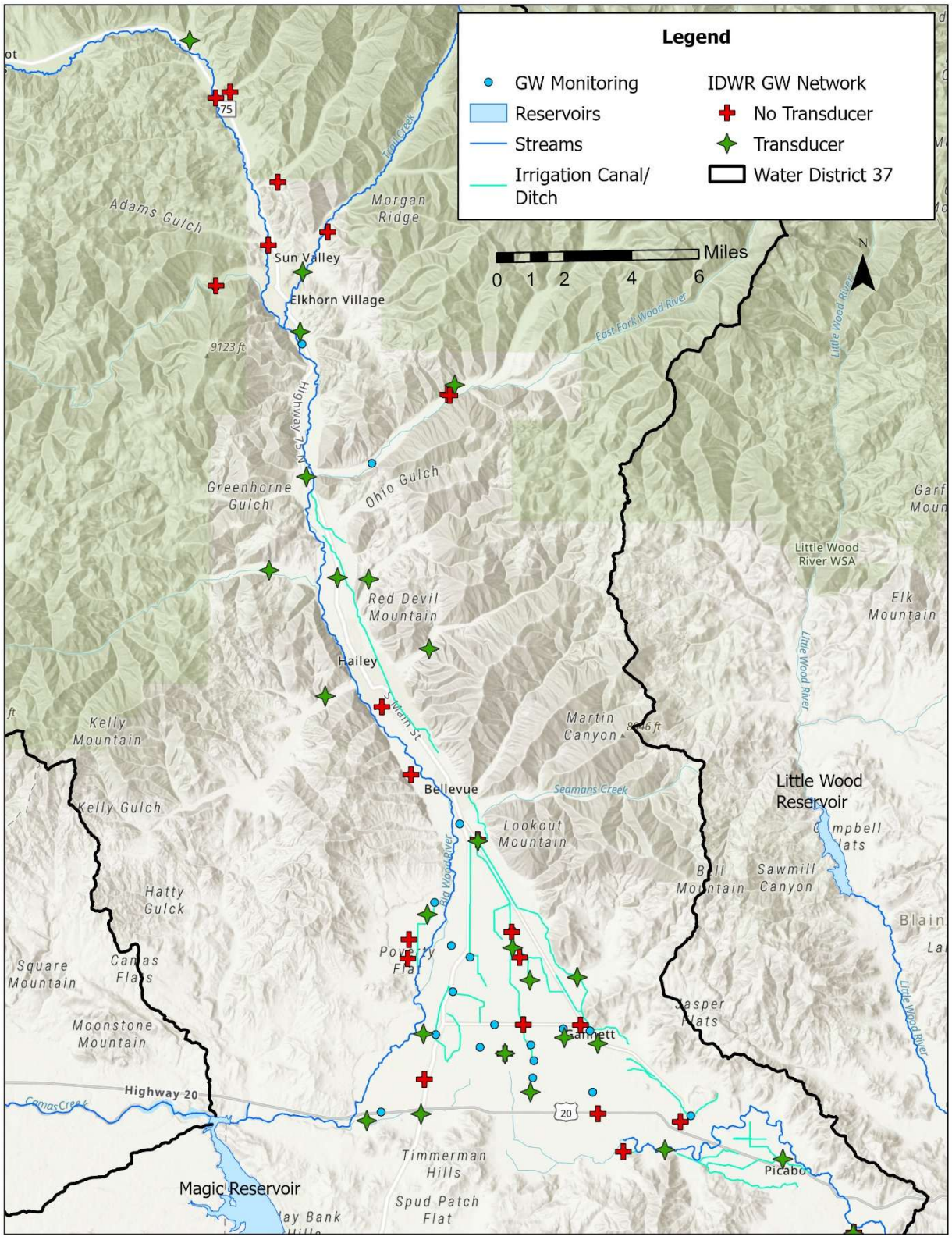

Figure 9. Water level monitoring in the upper basin.

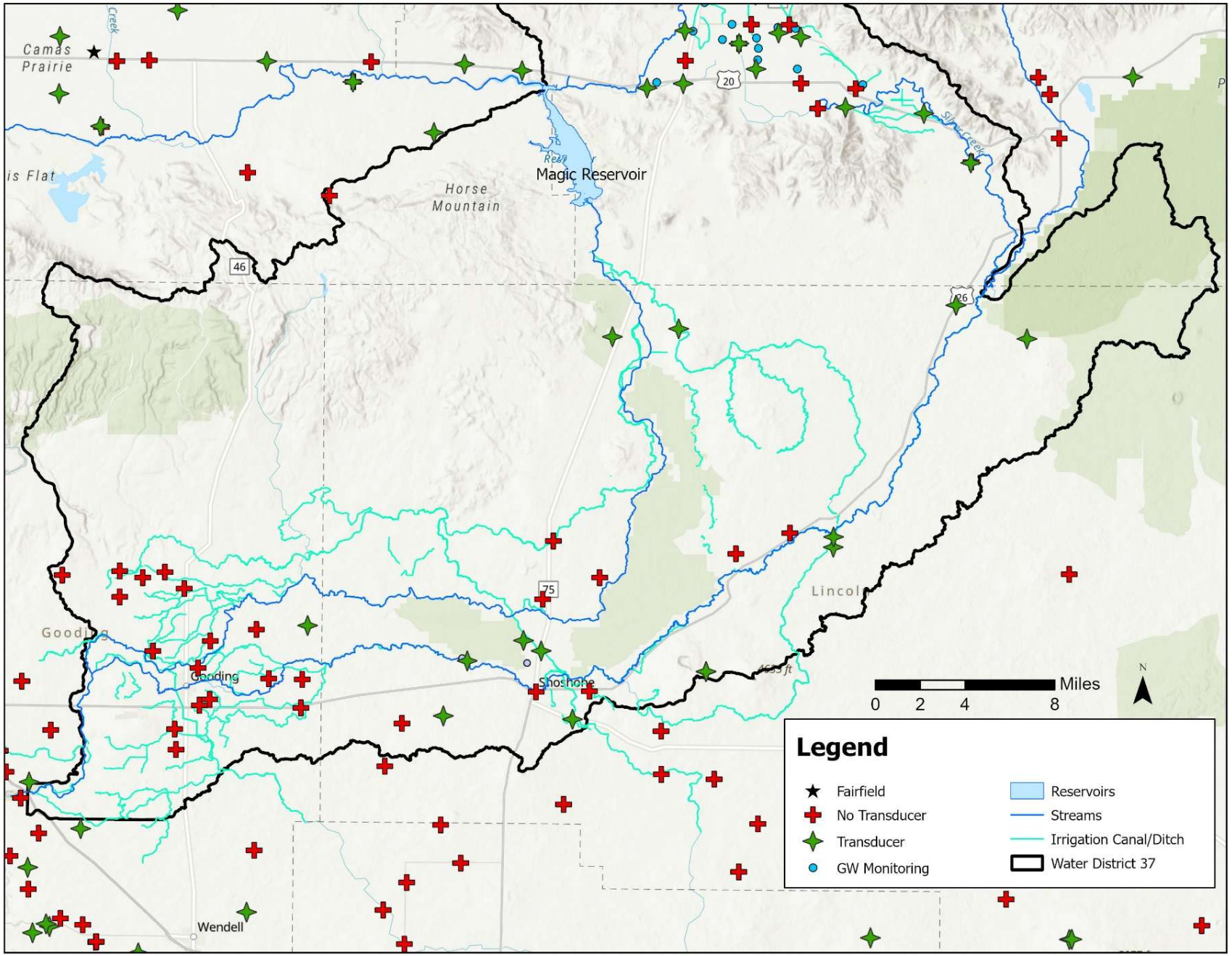

Figure 10. Water level monitoring in the lower basin.

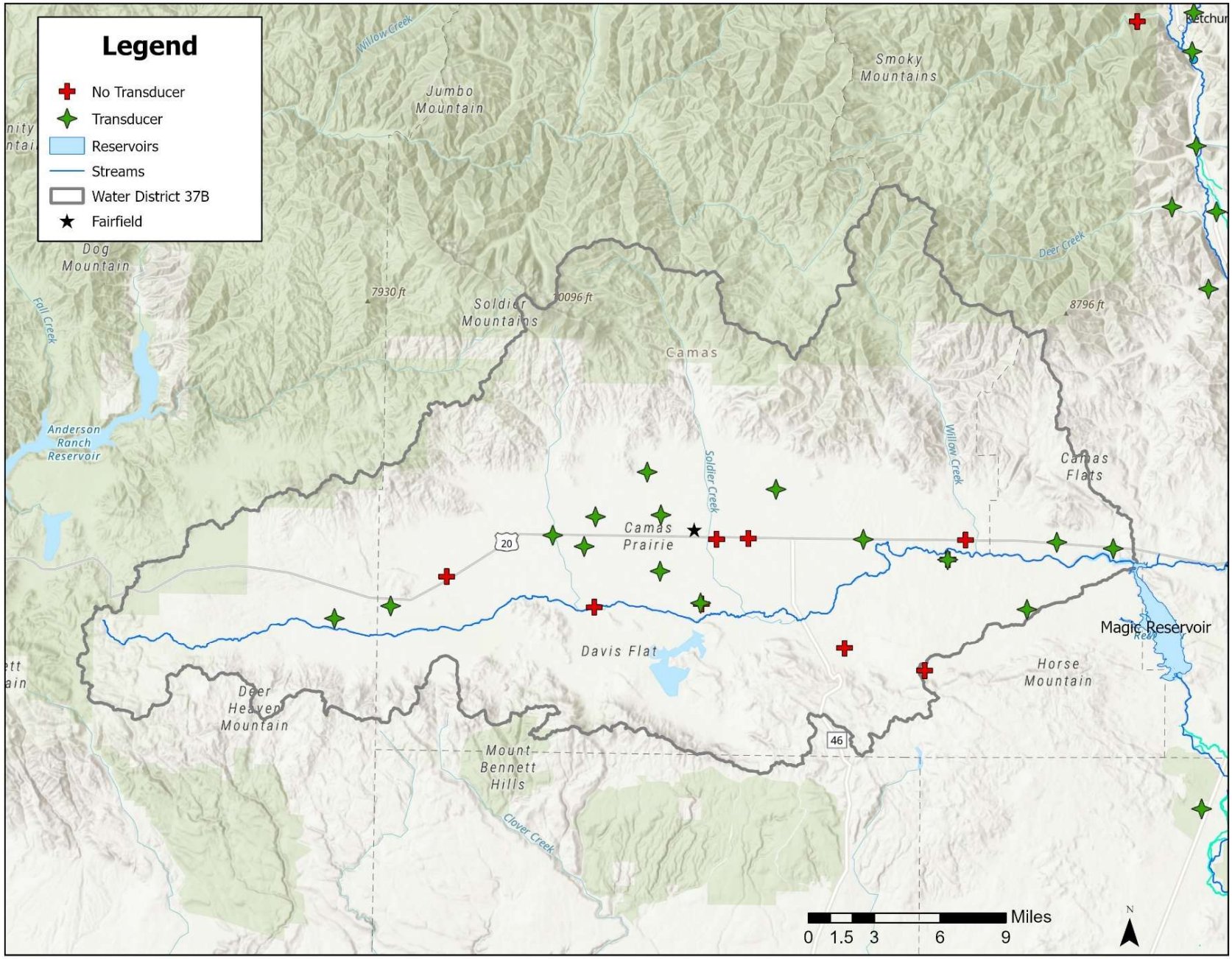

Figure 11. Water level monitoring on the Camas Prairie.

Table 1. Summary of recommendations.

Recommendation	Notes	Importance
USGS Magic Reservoir Bathymetry	Critical for the Accounting Model	High
Install a dependable gage downstream of the bifurcation	The current gage is not working correctly	High
Telemetered, real-time monitoring of Silver Creek diversions and exchange wells	Telemeter real-time data	High
Telemeter groundwater pumping	Telemeter real-time data	High
Increased Site Visits to Sportsman in June	Keep schedule at two weeks, but start June 1st	High
Online Data Hub	Serve many data types online in conjunction with recommended telemetry	Medium
Temporary gage on Little Wood at the Confluence with Silver Creek	May not be significant flow	Medium
Add WL monitoring in Warm Springs Creek valley	Necessary to replace previous monitoring well	Medium
Telemeter Groundwater Levels	Allow all stakeholders to see aquifer conditions during the irrigation season	Medium
Telemetered, real-time stream gaging of Silver Creek and its tributaries	Telemeter real-time data	Low
Install two gages to monitor Silver Creek Wetlands	Depends on ability to reduce seepage	Low
Map the locations of important diversions, returns, and stream flow	Help all stakeholders understand the system	Low
SCADA Improvements	BWCC expressed no need	No recommendation
Install Gage at Suzie Q	Monitoring Silver Creek diversions and exchange wells upstream of Sportsman is a better use of resources.	Not a need

In general, the most substantial improvements would be made by focusing on improving the accuracy and frequency of the measuring and reporting of diversions (both surface water and groundwater).